



## **The International Molecular Subtyping Network for Foodborne Disease Surveillance**

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### **What is PulseNet USA?**

PulseNet is an early warning system for outbreaks of foodborne disease. It is the national network of >70 public health and food regulatory agency laboratories that performs DNA “fingerprinting” on bacteria that may be foodborne. The network identifies and labels each “fingerprint” pattern and permits rapid comparison of these patterns through an electronic database at the Centers for Disease Control and Prevention (CDC) to identify related strains. The “fingerprinting” is called pulsed-field gel electrophoresis (PFGE), which can distinguish strains of an organism such as *Escherichia coli* O157:H7 at the DNA level. Currently, PulseNet has databases for the following organisms: *E. coli*, *Salmonella*, *Shigella*, *Listeria*, *Campylobacter*, *Vibrio cholerae*, *Yersinia pestis*, and *V. parahaemolyticus*.

### **Why was PulseNet developed?**

In 1993, a large outbreak of foodborne illness caused by the bacterium *Escherichia coli* O157:H7 occurred in the western United States. It was detected 39 days after the first case fell ill by an alert clinician and it took almost two weeks to determine the source of the outbreak—hamburger patties served at a large chain of regional fast food restaurants. A total of 726 people fell ill and four died. In this outbreak, scientists at CDC performed DNA “fingerprinting” by PFGE and determined that the strain of *E. coli* O157:H7 found in patients had the same PFGE pattern as the strain found in the hamburgers. To speed up the time to recognize such foodborne outbreaks, CDC developed standardized PFGE methods, and in collaboration with the Association of Public Health Laboratories (APHL) trained the local microbiologists to perform PFGE themselves, thus decentralizing the subtyping procedure out to the states close to where the outbreaks occur. This significantly decreases the time to recognize case clusters of foodborne infections and allows for the investigation and control of the outbreaks while they are still occurring.

### **How does PulseNet work?**

PulseNet participants perform DNA “fingerprinting” by PFGE on disease-causing bacteria isolated from humans and from suspected food, animal, and environmental sources using standardized equipment and protocols. Once these PFGE patterns are generated, they are entered into an electronic database of DNA fingerprints at the Public Health Laboratory. Certified PulseNet

participants submit their results directly to a central server at CDC as well as post cluster information on the PulseNet discussion forum. This allows participants to alert CDC and other PulseNet participants of possible multi-state outbreaks so that a timely investigation can be done.

### **Why is PulseNet important to public health?**

PulseNet plays a vital role in surveillance for and investigation of foodborne illness outbreaks that were previously difficult to detect. Through finding similar patterns in PulseNet, scientists can link cases in outbreaks, even if the affected persons are geographically far apart. Outbreaks and their causes can be identified in a matter of days rather than weeks.

### **What is PulseNet International?**

Due to the success of PulseNet USA, similar networks have been established internationally in Canada, Europe, Latin America, the Asia Pacific, and the Middle East. These networks collaborate under the umbrella of PulseNet International.

The objectives of PulseNet International are to perform molecular surveillance of foodborne diseases at the global level in order to facilitate international outbreak detection and investigation by partnering with public health laboratories throughout the world and by building capacity for molecular surveillance of foodborne diseases.

Additionally, the participants collaborate on the development, validation and implementation of internationally standardized subtyping methods to be used in the networks and perform collaborative studies on the geographic distribution and spread of different clones of foodborne pathogens.

### **What are the future applications for PulseNet?**

PulseNet is expanding to include databases for other foodborne pathogens as well as bioterrorism-related agents. PulseNet will strive to achieve real-time detection of foodborne clusters, resulting in identification of hazards and implementation of new measures to increase the safety of our food supply. New subtyping methods are being developed, which will help further distinguish sporadic and outbreak cases in an increasing cost-efficient manner. PulseNet has already proved its value and will continue to save lives.